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attitudes giving us the vivid aspects of the present moment. Nor can the *opening* of a motor channel satisfy conditions, for this would carry us back to the cerebral psychology of the associationists, or to the misunderstood '*Innervationstheorie*' which has been discarded even by Wundt. The beginning of motor response to sensory stimulation would be nearer the truth. As Judd points out, Dewey has most adequately expressed the actual state of affairs by his 'sensori-motor' theory. "The sensation or conscious stimulus is not a thing or existence by itself; it is that phase of a coordination requiring attention because by reason of the conflict within the coordination, it is uncertain how to complete it." (Dewey, *Psy. Rev.*, 1896, p. 368, quoted by Judd, p. 202.) This sensori-motor theory is then examined in the light of the preceding experiments of the monograph and offered as a satisfactory explanation of them.

As a general suggestion in regard to the diagrams, tables and plates in this monograph, and also in other works, I offer the following: Could not each table, etc., have below a clearly printed set of explanations, etc., to facilitate reference? The constant reference back and forth is most confusing, and, as a matter of fact, most readers pass merrily by these tables, which are most laboriously gotten up for the purpose of elucidation. A proper set of explanations, directions, etc., clearly printed under each table, if necessary the whole thing occupying a separate page, would help the reader in getting the most out of them.

FELIX ARNOLD.

NEW YORK CITY.

An Introduction to the Theory of Mental and Social Measurements. EDWARD L. THORNDIKE, professor of educational psychology in Columbia University. New York, The Science Press. 1904. 8vo. Pp. xii + 212.

The few unimportant errors and omissions in this admirable book have been pointed out by various reviewers. I shall use the limited space that can be given to it here to speak of three particular excellencies, which make it the best introduction to statistical theory yet published, and a text-book that ought to mark an important departure in college training.

To begin with the simplest matters first, Professor Thorndike's more strictly practical chapters, on the arithmetic and algebra of the actual operations proper to statistical work, are marked not only by the simplicity and clearness of statement that are indispensable in such writing, but also by the ingenuity of a mind that has attained extraordinary cleverness in dealing with concrete cases. Students not altogether unfit for statistical work have had their difficulties with Bowley and Davenport. No student who can 'scrape through' the mathematics of his freshman year can fail to master Professor Thorndike's chapters on 'The Arithmetic of Calculating Central Tendencies and Variabilities,' 'The Transmutation of Measures by Relative Position into Terms of Units of Amount,' 'The Measurement of Differences and Changes,' and 'The Measurement of Relationships,' if he applies his mind to the task. These chapters alone would make Professor Thorndike's work more useful as a practical handbook in statistics than any other.

Of far greater importance, however, are the earlier chapters, setting forth the nature of statistical quantities, and, in particular, of mental and social measurements. Here, for the first time in the literature of statistics, we have a fairly adequate presentation of the difference between a full statistical statement in the form of tables and surfaces of frequency, on the one hand, and, on the other hand, condensed expressions, such as the average, the average deviation, the mode and the median. The full significance of this difference is brought out particularly well in chapter IV., on 'The Measurement of a Group.' The figures, 21 to 47, showing the actual distribution of measurements in a well-chosen variety of concrete subjects, are among the most instructive pages upon which the beginner in exact scientific research can spend his time. Not less commendation should be given to the pages on 'the interpretation of the form of a surface of frequency,' 'homogeneous and mixed groups,' and 'selected groups.' The reader who really masters the ideas conveyed by these pages will be well grounded in the fundamental notions of statistical thinking. He will be in no danger of mistaking the commonplace columns of undistributed figures that do duty for statistical 'reports,' for the real information that science calls for.

This admirable account of the actual distribution of frequencies in concrete cases leads naturally to a further discussion, that, namely, contained in chapter V., on 'The Causes of Variability and the Application of the Theory of Probability to Mental Measurements,' in which I find the third particular excellence of Professor Thorndike's work. He has seen clearly the important truth that when we have collected a great number of tables or surfaces of frequency we shall have so many, and such endlessly varied, departures from the 'normal' or 'probability' curve, that we shall perhaps no longer be justified in calling the probability curve normal in the sense of preponderatingly frequent for mental and social phenomena. His independent study of this subject has brought him to a certain conclusion which, although unobtrusively stated as a footnote on page 70, is in my judgment the most important paragraph in the book, and I therefore quote it:

It is a question whether students of mental measurement should not from the beginning be taught to put the so-called normal distribution in its proper place as simply one amongst an endless number of possible distributions, each and all due to and explainable by the nature of the causes determining the variations in the trait. The frequency of the occurrence of distributions somewhat like it could then be explained by a *vera causa*, the frequency of certain sorts of causation. On general principles this seems desirable, but in order to make for the student connections with the common discussions of statistical theory and practice and with the concrete work that has been done with mental measurements, I have compromised and subordinated the general *rationale* of the form of distribution to the explanation of the probability curve type.

I believe that I am not wrong in thinking that this is a far sounder view than the one which students usually obtain from books like Jevons's 'Principles of Science' and Venn's 'Logic of Chance,' and it is in har-

mony with some of the later thinking of Karl Pearson and others, including Norton.

I can not leave this excellent book without making a pedagogical suggestion. If I had the making of the list of required studies in an American college course, I should put into it a term's drill in this book of Professor Thorndike's, whatever mathematical requirement I had to throw out to make place for it. Or, if necessary, I would substitute it for the required work in political economy; for it is a book that opens up, as nothing else ever has opened, the whole realm of scientific ideas and scientific methods in the so-called, but not really, inexact sciences.

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The Elements of Psychology. EDWARD L. THORNDIKE. New York: A. G. Seiler. 1905. Pp. xix + 351.

This is a book that will surely interest every teacher of psychology. The author is not only an original investigator of high standing and a clear and forceful writer, but he has done what few, if any, other psychologists of reputation, have done in writing a text-book, *i. e.*, thought more of the impression to be produced upon beginning students than of what his fellow psychologists may think about what he says. It is true that psychologists as such will find it a thoroughly scientific, up-to-date treatment of the subject in which the really important truths of psychology are emphasized, yet it is as a text-book for beginners that the work is especially important.

As a scientific work the chief characteristic to be noted is the prominence given to dynamic psychology, which occupies nearly half of the whole book. The treatment of descriptive and physiological psychology, though brief, includes all the essential elements. The biological and genetic point of view is prominent in all parts of the work. Unlearned and learned reactions to situations made possible by nerve connections is the basal thought of nearly all discussions of mental processes. The prominence given to instinct and habit and to the applications of the laws of habit to all kinds of mental operations and to various life situations makes the book a most excellent foundation for the science of education.

The chief point upon which the author presents a view opposed to the common one is regarding the images of movement sensations as initiators of movement. He holds that the stimulus to movement is usually an external situation or end, sensed or imaged, instead of an image of the subjective sensations that have been experienced in executing such a movement. With this view the reviewer is in sympathy. Unfortunately, in the preface, the author states the matter in a way that implies the more radical view that images of movement sensations *never* excite movement, and that this view is held by the reviewer and others. It seems to the writer clear, in all cases where the movement sensations are more important events in the mind of the actor than the objective results of the